

Radar Interferometry for Monitoring of Oil Fields and Dams: Lost Hills California and Aswan Egypt

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Elevation changes caused by fluid extraction or mass loading can be detected and monitored by the technique of SAR (synthetic aperture radar) interferometry, or InSAR. Such measurements can have high spatial resolution (10s of meters), and great sensitivity to vertical elevation changes (few mm level), providing a geographically comprehensive map of surface deformation. Such capability is potentially a significant complement to traditional surveying methods for monitoring oil fields and dams, particularly in remote areas. In order to test the potential use of radar interferometry for monitoring, we collected and analyzed a time series of ERS (European Radar Satellite) data for the Lost Hills/Belridge Oil Fields in the San Joaquin Valley of California, and also for the Aswan Dam region in Lower Egypt. In the case of Lost Hill/Belridge, we measured subsidence rates as great as 40 mm in 35 days over the period 5/95 to 4/96, which was demonstrably confined to the oil field property. Subsidence is monitored and controlled by the oil field operators. In the case of the Aswan Dam, initial filling was accompanied by minor seismic activity, particularly on the Kalabsha fault. Recently, minor seismic activity has been related to the current highstand of Lake Nasser behind Aswan. We detected no surface deformation in the region of the Lake Nasser over the 5/96 to 4/98 timespan of the radar observations.